

REMARKS

Claims 1 and 3-15 were examined. By present amendment, claims 25-33 were added, and claims 3 and 4 were amended to more particularly point out and distinctly claim the subject matter that the Applicants regard as the invention. No claims have been canceled, and no new matter has been added. Thus, after entry of this Amendment, claims 1, 3-15, and 25-33 are pending in the application.

Acknowledgment of Priority

Applicant gratefully acknowledges the Examiner's entry of Applicant's priority papers.

Allowable Subject Matter

Applicants gratefully acknowledge the Examiner's indication that claims 5-10 and 14 would be allowable if rewritten in independent form, including all of the limitations of the base claim and any intervening claims.

Objections to the Abstract

The word "following" has been changed to "followed" in line 4 of the Abstract. Withdrawal of the objection is respectfully requested.

Rejections under 35 U.S.C. §112, second paragraph

Claims 3, 4, and 11 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite because they depend from a canceled claim.

In response, Applicants have amended claims 3 and 4 to depend directly from claim 1.

Withdrawal of the rejection is respectfully requested.

Rejections under 35 U.S.C. §102(b)

Claims 12 and 13 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,004,672 to D'Ottavio et al. (D'Ottavio).

The Patent Office states that D'Ottavio discloses providing a substrate, electrophoretically depositing a polymer precursor, polymerizing the precursor, and depositing a copper layer thereon by electroplating. Thereafter, the polymer layer is polymerized, and the layer is heated to 200°F after about 5 minutes. The Patent Office claims that five (5) minutes is about six (6) minutes and 200°F is about 400°F.

The rejection is respectfully traversed.

D'Ottavio, when taken as a whole, discloses a photolithographic process in which a photoresist is applied to a metal substrate by electrophoretic deposition. Thereafter, a pattern is exposed to UV radiation to cure or cross-link a portion of the photoresist, followed by etching the exposed metal and removal of the cross-linked photoresist. D'Ottavio, when taken as a whole, discloses a process that is limited to photochemically active polymers that are used to print fine dimensions on printed circuit boards.

In contrast, the present invention is directed to a method that involves providing a substrate and coating at least a portion of the substrate with a layer of an electrophoretically applied polymeric precursor. The polymeric precursor is polymerized to form a first polymeric coating and the temperature of the polymeric coating is elevated to at least about 400°F for at least about six (6) minutes.

D'Ottavio fails to disclose the step of elevating the temperature of the polymeric coating to at least about 400°F for at least about six (6) minutes. D'Ottavio does disclose polymerizing the photoresist by baking at about 200°F, but there is no separate step is disclosed in which the temperature of the polymeric coating is elevated to at least about 400°F for at least about six (6) minutes.

Second, Applicant disagrees that a two-fold increase in temperature from 200°F can be considered “about” 400°F. If the Patent Office maintains the rejection, Applicant respectfully requests that the Patent Office provide evidence of the same.

Because each and every element of claim 12 is not disclosed in any of the cited references, it cannot be anticipated and is allowable. The claims that depend from claim 12 directly or indirectly are allowable for at least the same reasons. Withdrawal of the rejection is respectfully requested.

In addition, there is no motivation in D’Ottavio to elevate the temperature of the photoresist to greater than 200°F because as those of ordinary skill in the art would recognize, doing so would make removal of the cured resist difficult or impossible, preventing completion of subsequent steps and rendering the printed circuit board unsuited for its intended purpose.

Rejections under 35 U.S.C. §103(a)

A. Claims 1, 12, 13 and 15 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,334,942 to Haba et al. (Haba) in view of U.S. Patent No. 5,981,079 to Mount, III et al. (Mount).

The Patent Office acknowledges that Haba fails to disclose the formation of a metal layer under sub-atmospheric conditions. The Patent Office states that Mount discloses that electroplating and sputtering are equivalent.

Applicants respectfully traverse the rejection.

Haba discloses a semiconductor wafer fabrication process in which a metal layer is deposited by electroplating. Mount discloses a semiconductor wafer fabrication process in which a metal layer is deposited preferably by vacuum deposition (Col. 5, lines 19-23). Haba and Mount, alone or in combination, fail to disclose, teach, or suggest the method of claim 1 in which a metal coating is applied to at least a portion of the polymerized layer, and in which the metal coating is applied under sub-atmospheric conditions. Haba and Mount, alone or in combination, also fail to disclose, teach,

or suggest the method of claim 15, in which a polymeric coating is formed from an electrophoretically applied polymeric precursor and a layer of metal is applied over the polymeric coating using a physical vapor deposition process.

The Patent Office has cited Mount for the proposition that electroplating and sputtering are equivalent. While it may be true that metal layers resulting from either electroplating or sputtering may be considered equivalent in some instances, those of ordinary skill in the art of semiconductor processing would know that the processes by which electroplated and sputtered films are formed cannot always be used interchangeably. For example, one of ordinary skill in the art would not be led to sputter a layer over a photoresist because the energy from sputtering can polymerize the resist to the extent that it cannot be removed. Thus, the processes cannot be used interchangeably. Should the Patent Office maintain this rejection, Applicant respectfully requests that it provide evidence under MPEP §2144 that sputtering and electro-plating are equivalent processes for similar uncured polymer coated surfaces.

Thus, there is no motivation to replace the electroplating process of Haba with the sputtering process of Mount. Even if one were motivated to do so, the process of Haba would no longer function properly for its intended purpose because the resist could not be removed.

Haba and Mount, alone or in combination, also fail to disclose, teach, or suggest the method of claim 12, in which at least a portion of a substrate is coated with a layer of an electrophoretically applied polymeric precursor, and the polymeric precursor is polymerized to form a first polymeric coating and the temperature of the polymeric coating is elevated to at least about 400°F for at least about six (6) minutes.

The Patent Office did not discuss claim 12 vis-a-vis the combination of Haba and Mount. Nonetheless, Applicant states that Haba and Mount, alone or in combination, fail to disclose the step of elevating the temperature of the polymeric coating to at least about 400°F for at least about six (6) minutes.

Moreover, there is no motivation to elevate the temperature of the photoresist to greater than 200°F because as those of ordinary skill in the art would recognize, to do so would make removal of the cured resist difficult or impossible, rendering the printed circuit board unsuitable for its intended purpose.

Claims 1, 12 and 15 are therefore patentable over Haba and Mount, alone or in combination. The claims that depend from claims 1, 12 and 15 directly or indirectly are patentable for at least the same reasons. Withdrawal of the rejection is respectfully requested.

B. Claims 1 and 15 were also rejected as being obvious as being unpatentable over D'Ottavio in view of Mount. The Patent Office states that Mount discloses sputtering rather than electroplating and that it would have been obvious to modify the D'Ottavio to deposit the metal layer by sputtering.

D'Ottavio and Mount are discussed above.

D'Ottavio and Mount, alone or in combination, fail to disclose, teach or suggest or provide any motivation for sputtering a metallic layer over a photoresist, in place of electroplating. Moreover, there is no motivation in either of the references to do so, because doing so would make the removal of the cured resist difficult or impossible, rendering the printed circuit board unsuited for its intended surface.

Claims 1 and 15 are patentable over D'Ottavio and Mount, alone or in combination. The claims that depend from claims 1 and 15 directly or indirectly are patentable for at least the same reasons. Withdrawal of the rejection is respectfully requested.

New Claims 25-33

New claim 25 includes the subject matter of claims 1 and 5, which the Patent Office has indicated is allowable. New claims 26-33 depend from claim 25 directly or indirectly, and are allowable for at least the same reasons.

CONCLUSION

In view of the foregoing amendments and remarks, the Applicants respectfully submit that all of the claims pending in the above-identified application are in condition for allowance, and a notice to that effect is earnestly solicited.

If the present application is found by the Examiner not to be in condition for allowance, then the Applicants hereby request a telephone or personal interview to facilitate the resolution of any remaining matters. Applicants' attorney may be contacted by telephone at the number indicated below to schedule such an interview.

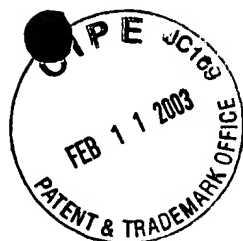
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Respectfully submitted,
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Art Unit: 1753
Serial No: 09/833,036

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Version with marking to show changes to claims

3. (Amended Once) The method of claim [2]1, wherein the step of forming the polymerized layer includes elevating the temperature of the polymeric precursor to a temperature of at least about 320°F.

4. (Amended Once) The method of claim [2]1, wherein the polymeric precursor is selected from the group consisting of acrylics, epoxies, urethanes, and combinations thereof.



Art Unit: 1753
Serial No: 09/833,036

Version with marking to show changes to the Abstract

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ABSTRACT

A method for providing a level surface onto which a metallic coating may be applied is provided. Articles formed using the method are also provided. The method involves leveling the surface of a substrate by applying an electrophoresis polymeric coating [following] followed by a physical vapor deposition of a metallic coating.